

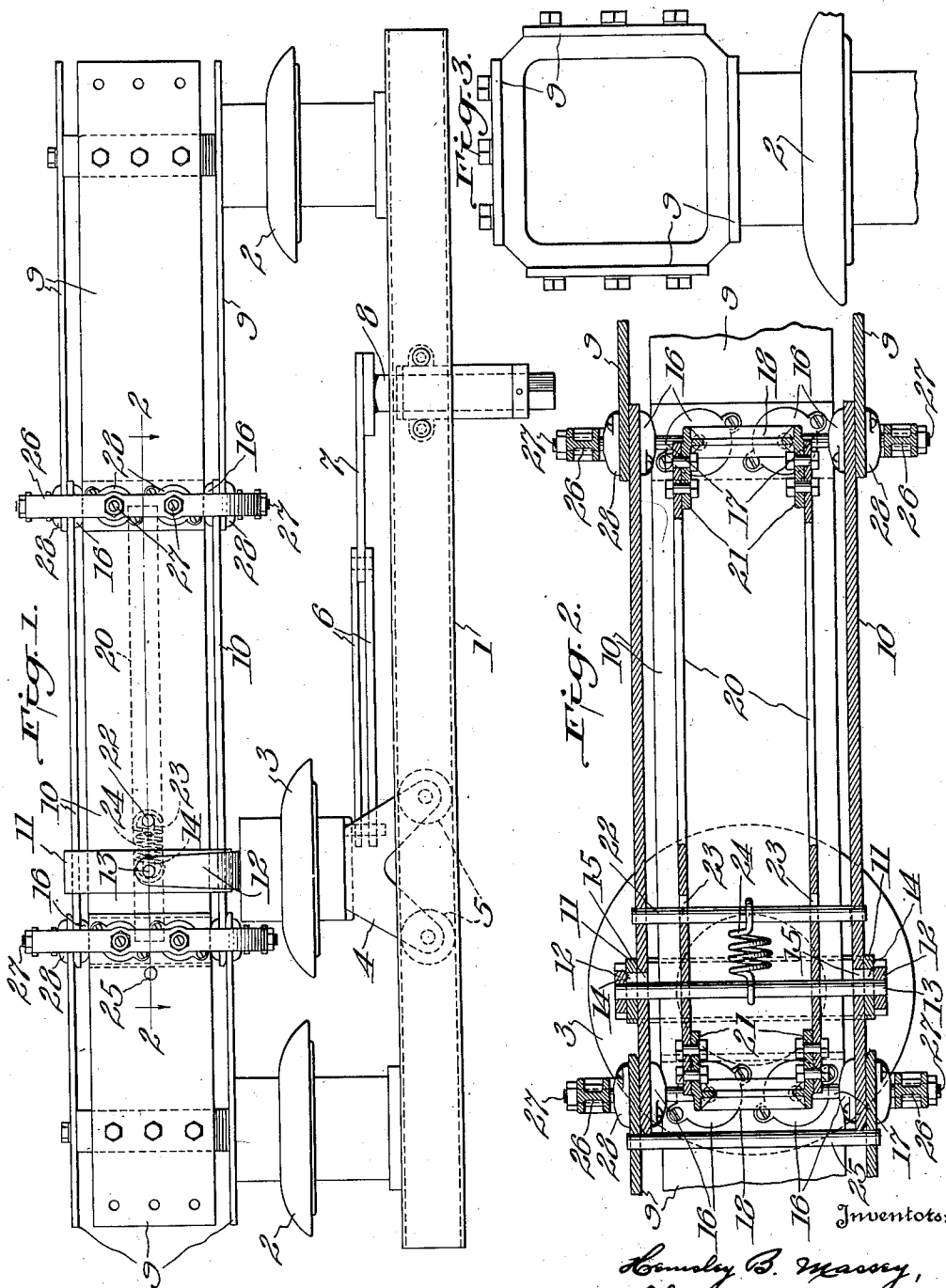
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2,008,139

HIGH TENSION ELECTRICAL SWITCH

Original Filed April 15, 1930 2 Sheets-Sheet 1



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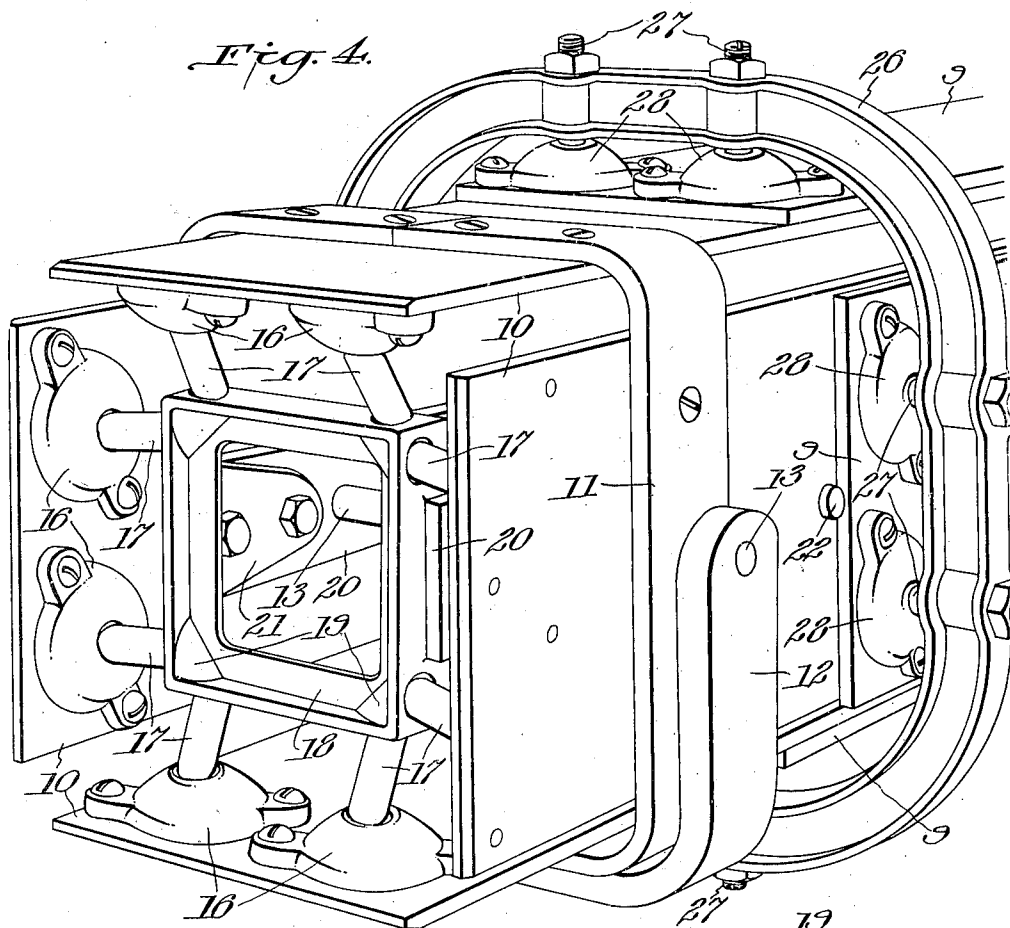
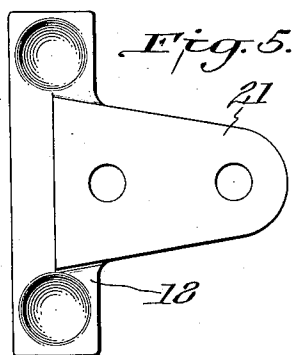
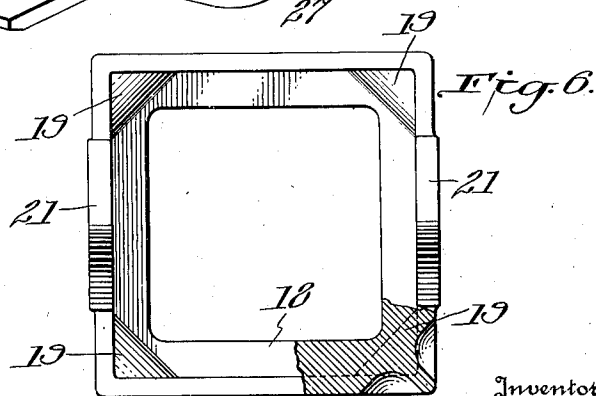
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UNITED STATES PATENT OFFICE

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HIGH TENSION ELECTRICAL SWITCH

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This invention relates to a high tension electrical switch.

tion with the accompanying drawings, wherein, Fig. 1 is a side elevation of the switch in closed position.

Fig. 2 is a horizontal section on line 2—2 of Fig. 1.

Fig. 3 is an end elevation,

Fig. 4 is a perspective view looking into the movable switch member in the disengaged position.

Fig. 5 is a side elevation of one detail, and

Fig. 6 is a top view thereof, one corner thereof being broken away.

Referring to Fig. 1, a support 1 is provided upon which is mounted the stationary insulators 2 and the movable insulator 3. The movable insulator 3 is secured to a frame 4 mounted on rollers 5 and guided for reciprocating movement in support 1. A lever 6 is secured to frame 4 and is connected to a crank arm 7 which in turn is connected to rotary shaft 8 secured to support 1. It will be seen that rotation of shaft 8 will impart reciprocating motion to insulator 3.

Each of the stationary insulators 2 has a strap thereon to secure a series of conductors 9 in the form of a hollow square. These conductors are apertured at their ends for clamping engagement with bus bars or conductors similarly arranged in the form of a hollow square. It will be noted that the conductors 9 at the right hand end of Fig. 1 are longer than those at the left hand end.

The space between the ends of the two groups of conductors 9 is adapted to be bridged by a movable set of blades 10 which are also arranged as a hollow square slightly smaller than that formed by conductors 9, the blades 10 telescoping within and contacting with blades 9. These movable blades 10 are attached to each other by a strap 11 surrounding and secured to each of the blades. A U-shaped bracket 12 which is secured to insulator 3 carries a cross pin 13, this pin passing through slots 14 in strap 11 and through slots 15 in the two opposite blades, these slots 14 and 15 being elongated in the direction of movement of the blades for a purpose to be later set forth.

As previously stated, one of the objects of this invention is to press the movable blades 10 under high pressure against the blades 9 after the movable blades have moved into place. The following construction accomplishes this result. Each blade 10 has secured thereto within the hollow square two socket members 16 adjacent each end thereof. Each socket member has a rounded cavity therein to receive a pin 17, each pin having its end correspondingly rounded.

As will be seen from Fig. 4, the pins 17 pro-

Electrical switch blades can be classed with buses from the standpoint that both are conductors of electric current. For buses and switch blades of ampere ratings such as 800 to 3000 it is quite customary to use one or more bars, usually arranged in the case of buses in a single group, with spaces between the bars equal to the thickness of the bar. For alternating currents of ratings above 3000 amperes it is a well established fact that in order to obtain the maximum current capacity with a given number of rectangular bars, it is necessary to depart from the single group of bars and arrange them in two or more groups; and one arrangement which is in use for bus bars of ratings 4000 amperes and above consists of four bars, or four groups of bars, arranged with two groups horizontal with a spacing between groups in excess of the width of the bars used, together with two groups of vertical bars with a similar spacing, each group equidistant from a center or axis common to both vertical and horizontal bars.

This grouping of bus bars is commonly referred to as hollow square arrangement and has been found very efficient for heavy alternating currents. The ordinary disconnecting switch has blades hinged to one terminal. The hollow square arrangement if used for switch blades does not adapt itself for hinging in the usual manner.

One object of this invention is to construct a switch which will utilize the high efficiency of this type of conductor both in the blade and in the terminals, so that when connected in the bus it will form a continuous hollow square conductor arrangement.

Another object of this invention is to provide a simple means for applying high pressure to a multiplicity of contact surfaces between terminals and blade after the blade has been closed.

Another object is to provide a switch of this type wherein a telescoping form of blade and contact is used and provided with means to allow the movable and stationary members of the switch to telescope one upon the other, and to apply high pressure between these members after their initial engagement.

A further object is to construct operating mechanism arranged to release the high pressure normally existing when the switch is closed prior to disengaging movement of the movable contact.

These and further objects will be apparent from the following description when taken in connec-

ject inwardly from the blades 10 and their inner ends are seated in corresponding cavities in a square block 18. This block 18 is made strong and rigid to withstand heavy pressures exerted thereon by pins 17, and to that end it has a cross-section in the form of a T. As seen in Fig. 6, the cavities for the reception of pins 17 are placed near the corners of member 18 and each corner is thickened, as indicated at 19, to have the required rigidity and strength.

The pins 17 are of such length that upon relative movement of block 18 with respect to blades 10 the pins act as short toggle arms to cam blades 10 outwardly. It will be noted that sockets 16, pins 17 and block 18 are duplicated at each end of movable blades 10. The two blocks 18 are rigidly connected together by a pair of flat bars 20, these bars being secured to lugs 21, which lugs are integrally formed with blocks 18. Movement of bars 20 will therefore impart movement to both blocks 18.

In order to move blocks 18 with respect to the movable blades 10, thus tilting the toggle pins 17 to spread the blades, the pin 13 which is rigidly secured to movable insulator 3 passes through and has a close fit in bars 20. Pin 13, however, may move with relation to blades 10 for the length of slots 14 and 15. A cross-pin 22 is connected to two blades 10, said pins passing through slots 23 in bars 20. A tension spring 24 connects pins 13 and 22. The spring 24 thus tends to move blocks 18 to the right of Figs. 1 and 2 to thus tilt toggle pins 17.

In the open position of the switch as seen in Fig. 4, the toggle pins 17 are tilted and pressure is relieved from the blades 10. In moving to closed position the blades 10 telescope with blades 9 in rubbing engagement therewith, the corresponding edges of blades 9 and 10 being beveled to facilitate this engagement, as shown. A stop pin 25 is secured to the blades 9 of the left hand contact, said stop pin being engaged by the movable blades 10 when said blades 10 have fully engaged within blades 9. Further movement of insulator 3 to the left will move blocks 18 with respect to blades 10 to thus spread blades 10 outwardly by a camming movement of pins 17.

Cooperating means are provided adjacent the ends of stationary blades 9 to rigidly hold blades 9 against outward movement when blades 10 spread outwardly. Such means comprises a clamp 26 surrounding the ends of blades 9, the clamp as illustrated being an I beam for greater rigidity. This clamp 16 is adapted to receive threaded members 27 which engage in socket members 28 secured to blades 9, lock nuts being provided to maintain the adjustment of members 27. The blades 9 may thus be adjusted to position and will be prevented from spreading outwardly when pressure is applied upon blades 10.

It is believed that the operation will be clear from the above description. The blocks 18 assume the position as shown in Fig. 4 when the switch is open, due to spring 24. When insulator 3 moves to the left the blades 10 enter and telescope within the left hand stationary contacts 9 until they engage stop pin 25. Further movement of insulator 3 moves pin 13 to the left hand end of slots 14 and 15, thus moving blocks 18 to the left with respect to blades 10. The toggle pins 17 are thus straightened from their tilted positions to spread blades 10 outwardly at the two ends thereof into engagement with blades 9 under very high pressure, clamps 26 preventing a corresponding outward movement of blades 9. In

opening the switch initial movement of insulator 3 to the right moves bars 20 to thus move blocks 18 to break toggle pins 17 and release the high pressure of contact. When pin 13 reaches the right hand end of slots 14 and 15 the blades 10 then move to the right with the insulator 3. Cross pin 22 projects slightly beyond blades 10 to engage with stationary blades 9 at the right hand end to thus stop movement in the opening direction.

Although this invention has been shown and described in connection with a switch wherein the stationary and movable blades form a hollow square, it will be obvious that other forms of hollow switch members may be used, such as triangular, pentagonal, hexagonal or other shapes, or the switch members might be curved to form a slotted cylinder or oval.

It will be obvious that various other modifications of the structure as shown may be made without departing from this invention, as expressed in the following claims.

We claim:

1. In an electric switch, opposed stationary contacts forming a substantially closed hollow body, switch members including contacts movable into said hollow body, toggle pins engaging at one end against said movable contacts, means pivotally supporting the other ends of said toggle pins, and means for moving both said switch members and said supporting means, said operating means having a lost-motion connection to said switch members, thereby to effect further movement of said supporting means after said switch members are moved into their final closed position by said operating means and to effect an initial movement of said supporting means before said switch members are moved from said final closed position during opening movement of said switch.

2. In an electric switch for use with bus bars arranged as a hollow square, opposed stationary contacts forming a substantially closed hollow square, movable switch members forming a similar but smaller substantially closed hollow square reciprocating means for telescoping the movable switch members into the substantially closed hollow square formed by the stationary contacts, said reciprocating means having a lost-motion connection to said switch members, means to expand the substantially closed hollow body formed by the movable switch members, and means connecting said expanding means to said reciprocating means.

3. The structure as set forth in claim 2 wherein rigid clamping means encloses the stationary contact to prevent expansion thereof, whereby a high pressure contact is obtained.

4. In an electrical switch, the combination with a stationary insulator, a switch contact mounted on said insulator and having a pair of opposed contact surfaces, a movable contact comprising a pair of parallel flexible blades, a reciprocating carrier supporting said movable contact for positioning said flexible blades between the opposed surfaces of said switch contact, means secured to said carrier and positioned between said blades for flexing the same outwardly, and a lost motion connection between said carrier and said movable contact, whereby said movable contact is positioned between said opposed contact surfaces by reciprocation of said carrier and the further movement thereof serves to operate said flexing means.

5. In an electrical switch, the combination with a pair of longitudinally spaced contacts each

including a pair of transversely opposed contact surfaces, a movable contact comprising two substantially parallel blades, and means for reciprocating said movable contact into and out of position bridging the said longitudinally spaced contacts, of means actuated by said reciprocating means for flexing said blades into high pressure contact with the respective spaced contacts at the end of the closing movement of said switch and for relieving said high pressure contact at the beginning of the opening movement of said switch.

6. In an electric switch, opposed stationary contacts, correspondingly shaped movable contacts, a reciprocating carrier having a lost motion connection with said movable contacts for moving the same into and out of position between the opposed stationary contacts, a rigid support between the movable contacts, toggle pins supported at one end in said rigid support and at the other end against said movable contacts, means rigidly connecting said rigid support and said reciprocating carrier, and a stop for engaging said movable contacts when they have been moved to a position within the stationary contacts, whereby continued movement of the carrier moves the rigid support to straighten said toggle pins and expand the movable contacts.

7. The structure as in claim 6 wherein a spring normally holds the movable contacts at one end of the relative movement between said contacts and said rigid support.

8. In an electric switch, two sets of stationary contacts in longitudinal alignment, each of said sets having transversely opposed contacts, a reciprocating switch member having contacts for bridging the two sets of stationary contacts, said movable contacts being adapted to telescope within the opposed stationary contacts, means for expanding the movable contacts into high pressure engagement with each set of opposed stationary contacts, means connecting said expanding means for simultaneous operation, and operating means connected to said expanding means and having a lost-motion connection to said movable contacts, whereby on closing movement of said switch the continued movement of said operating means as permitted by the lost-motion connection after the movable contacts are in closed circuit position actuates said expanding means.

9. In an electric switch, a base, a plurality of

sets of bus bars, each set of bus bars comprising a stationary contact in the form of a hollow body, carrier means, a plurality of bus bars mounted on said carrier means and defining a movable contact of hollow form conforming to the shape of said stationary contacts, and means for reciprocating said carrier means to telescope said movable contact within and bridging the said stationary contacts.

10. A switch as claimed in claim 9, in combination with means for expanding the said plurality of bus bars of said movable contact into high pressure engagement with said stationary contacts during the final closing movement of said carrier means and for releasing said high pressure engagement at the initiation of the switch-opening movement of said carrier means.

11. An electrical switch comprising a pair of stationary contacts, each having a pair of opposed contact surfaces, a movable contact having a pair of contact elements adapted to engage respectively the correspondingly arranged contact surfaces of said pair of stationary contacts, operating means for reciprocating said movable contact into a position bridging said stationary contacts and alternatively into a non-bridging position, said reciprocating means having a lost-motion connection to said movable contact, and pressure means for forcing the said contact elements of said movable contact into firm contacting engagement with the contact surfaces of said stationary contacts, said operating means being movable through said lost-motion connection with respect to said movable contact to actuate said pressure means after said operating means has reciprocated said movable contact into bridging position with respect to said stationary contacts.

12. In an electric switch, two sets of stationary contacts in longitudinal alignment, each of said sets having transversely opposed contacts, a reciprocable switch member having similarly arranged contacts for bridging the sets of stationary contacts, said movable contacts telescoping within the opposed stationary contacts, a reciprocating carrier having a lost motion connection with said movable contacts, and means operable upon relative movement between said carrier and said movable contacts for expanding said movable contacts.

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